GENDER DIFFERENCES ON THE MORTALITY PATTERN ON CAUSES OF DEATH IN SPAIN: RECENT SIGNS OF CHANGE.

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The data on deaths by cause that have been used in this analysis refer to the *de facto* population and derive from the micro data published by the Instituto Nacional de Estadística (INE, Spanish Statistics Institute). Population data for the whole period (1975-2007) were taken from the Human Mortality Database (HMD). To define the denominator, we have used the population exposure to risk of death, which is more appropriate than the population size since the former includes a correction that reflects the timing of deaths during the interval. It was deemed appropriate to calculate age-standardized death rates by cause of death. The standard population we have used is the total (men plus women) Spanish population exposed to risk of death in 1991 as taken from the HMD, since that year falls in the middle of the period under study and also coincides with a census year. These age-standardized rates by cause of death have been calculated for each sex and for three age groups: 65-79, 80-89, and 90+ years old. They are expressed per 100,000 inhabitants. The European Shortlist for Causes of Death (Eurostat, 1998) is the standard list used in this work, since it establishes a correspondence between the three ICD revisions covered in the period (ICD8, ICD9 and ICD10). In the absence of a reconstruction of time series of mortality by causes, this common list eliminates the discrepancies between the different ICD revisions.

Six large sets of causes are considered: diseases of the circulatory system, diseases of the respiratory system, malignant neoplasms, diseases of the nervous system and the sense organs, mental and behavioral disorders, and external causes of injury and poisoning. However, we will focus more specifically on several causes within those six large sets that have a great impact on mortality among the elderly: cerebrovascular diseases; ischemic heart diseases; malignant stomach, colon, larynx and trachea/bronchus/lung, breast, prostate and bladder neoplasms; diabetes mellitus; influenza; pneumonia; chronic lower respiratory diseases, and suicide and intentional self-harm.

Regarding to large groups of causes, cardiovascular diseases are certainly the true motor and main component of the decrease in mortality during the last quarter of the century. We can observe a significant fall in the overall mortality, with a clear declining tendency in both sexes and the three age groups. The reduction of deaths due to this type of diseases is in consonance with what we know about the cardiovascular revolution in Western societies, although it is taking place with a certain delay (Caselli, Meslé and Vallin, 1995; Meslé and Vallin, 2002). It is worth noticing that, for this set of causes, both the tendency and the levels are very similar for both sexes, which means that the observable differences in overall mortality by sex are due to causes other than those associated with circulatory diseases. Mortality from this group of diseases has experienced a huge decline, being reduced by over half its value in the course of these three decades. Within this large set of causes, we can disaggregate two main causes of death: ischemic and cerebrovascular diseases. The most salient result of this analysis is the great fall in mortality from cerebrovascular diseases for both sexes and the three age groups.

We have found that mortality caused by the whole group of tumors was stabilized most of the time during this period, especially among men under 80, and it even experienced a slight decrease in the last years. In any case, for those aged 65-79, mortality caused by this tumor group is comparable to that due to circulatory system diseases. Differences by sex are very interesting within this set of causes, with male mortality being much higher than female mortality, indicating an overall high male mortality. The profile by sex clearly reflects male over-mortality in the case

of deaths associated with tumors, especially to larynx and lung cancers. The prevalence of this type of cancers increased during the period studied, although this tendency shifted during the 1970s and only recently experienced a slight reduction. The rise of mortality by cancer is in consonance with the current epidemiological transition in which we currently find ourselves. In addition to the biological factors which are linked to the greater longevity of the human species, the rising incidence of cancer is also due to the growing prevalence of certain habits that interfere with health – such as smoking and alcohol consumption – and are associated with changes in diet and lifestyle, and to the exposure to carcinogenic agents.

The trajectory of mortality by sex of mental disorders and nervous system diseases shows the greatest proportional increase during the period under study. The great interest of this double set of causes stems from their impact on the disability conditions among the elderly population, on the generation of dependency and also on the fact that they are the only two causes of death that present female over-mortality at older ages.

In the second part of this work we will analyze some causes of death that show indications of changing trends that might become important factors in the future evolution of differential mortality in Spain.

In the near future, we could expect a trend towards convergence of male and female mortality caused by tumors associated with tobacco consumption. In principle, there is not yet any convergence of the intensity of male and female mortality associated with these types of cancer, despite the currently high tobacco consumption habit of Spanish women, which nevertheless did not exist in the past among those cohorts building the older population today. Women's adoption of certain masculine habits that had been traditionally absent among women in the past occurred in Spain with a certain delay as compared to other countries and, thus, no indications of its possible effects and consequences are yet noticeable, at least among the cohorts included in the age groups under study.

Diabetes is another cause for which prevention through medical care, pharmacological treatments, periodic controls, a healthy diet and habits are important. Diabetes is a traditional cause of female over-mortality; however, its evolution benefited women aged 65-79 during the 1980s, leading to a lower female mortality as compared to men's from the middle of the 1990s.

Although they have quite different etiology and treatment, breast and prostate cancer are very sensitive to early detection. Thus, prevention plays an important role to lower mortality caused by them. Improvements in the diagnosis and specific therapies to treat these two types of tumors have had different effects on each age group, although the evolution of the overall impact is similar in older male and female populations.

We have selected one specific cause within this group, suicide, due to its importance at the end of the life cycle and because of the different behavior of women and men towards it, especially at advanced ages. This differential mortality by sex is probably one of the least biologically based, and it is in fact a good health index of old age populations. Our interest is also supported by the fact that male over-mortality is evident in this case. At advanced ages the incidence of suicide is high, and the difference between men's and women's behavior is clear.

Mental disorders and nervous diseases are the only ones showing an important increment along the period, especially at more advanced ages and during the last years. The increasing trend of mental disorders throughout almost the entire period is also evident in the case of nervous diseases, although at a smaller rate, especially during the last years. This is of major importance due to the consequences it has for the quality of life of the older people and of ageing societies as a whole. These two sets of causes constitute a potential brake on the extension of healthy life and on the achievement of the final objective of demographically advanced societies, which is to live longer without disability. The existence of long-lived populations in the absence of disability may represent a new stage in the mortality transition, but this stage may not be reached if mental and nervous diseases continue to spread in aged societies. On the other hand, if that happens, the feminization of disability will also continue to rise as a result of the existing sex-based differences in mortality and disability.

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